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Crown 8vo, Extra Cloth, Price 3s. 6d.

PHYSICAL AND ASTRONOMICAL GEOGRAPHY.

Specially designed for Pupil Teachers and Scholarship and Certificate Candidates.

By R. A. GREGORY,

Honours Medallist in Physiography; Solar Physics Committee, the Royal College of Science, South Kensington; Fellow of the Royal Astronomical Society; Foreign Correspondent of the 'Revue Generale des Sciences.'

WITH ORIGINAL ILLUSTRATIONS.

OPINIONS.

One of the best known Educationists of the day writes:—'Mr. Gregory's manual is simply magnificent.'

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Nature says:—'The general conception and arrangement of this volume are very good, and the same may be said of the detailed treatment of most of the subjects discussed. The chapter on the rotation of the Earth and consequent phenomena is exceedingly good, as is the following one on its revolution.

The account of eclipses and of the tides is also good, and well calculated to render these phenomena intelligible to learners. The chapters on the atmosphere and its movements are also clear and instructive, as are those on oceans and ocean currents. The numerous illustrations are clear, and elucidate some of the more difficult problems discussed.'

London: JOSEPH HUGHES & CO., Pilgrim Street, Ludgate Hill, E.C.

☛ SEE ALSO PAGE 239.

New Inspection Questions.

[We shall always be glad to receive (in strict confidence) *bona fide* Inspection Questions and Drawing Examinations from our readers.—Ed. *P. T.*]

TEST CARDS FOR STANDARD III.—GIRLS.

No. 1.

1. Add £4,789 16s. 8¼d., £2,007 18s. 4½d., £6,990 12s. 5¼d., £1,887 19s. 10¼d., £325 17s. 9½d.
2. From £7,507 17s. 7½d. take £770 18s. 11¼d.
3. Divide, 9,468,326 by 78.
4. From the sum of 168,793 and 84,768 take twice their difference.

No. 2.

1. Add £38,749 17s. 8½d., £90,876 12s. 6¼d., £3004 13s. 7¼d., £78 19s. 9½d., £9 10s. 10¾d., £84,769 8s. 7¼d.
2. From £48,179 13s. 4¼d. take £18,879 19s. 11¾d.
3. From 3,300 florins take 307 half sovs.
4. Divide 9,099,456 by 96.

No. 3.

1. Add £8,974 16s. 8¼d., £4,728 17s. 4¼d., £93 18s. 5½d., £6,218 15s. 5½d., £7 14s., 7¾d., £0 12s., 11¾d.
2. From £14,003 12s. 8¼d. take £98 17s. 9¾d.
3. Divide 13,986,074 by 98.
4. In 68 fields are 74,630 acres. How many acres is that in each field?

No. 4.

1. Add £9,046 17s. 8¼d., £35,763 13s. 3d., £44,044 18s. 1½d., £863 18s. 4½d., £13 11s. 2¾d., £90,090 19s. 11½d.
2. From £79,310 13s. 7¾d. take £43,934 17s. 9½d.
3. Divide 530, 039 by 417.
4. A town contains 907 streets, and in each street are 54 houses. How many houses would there be in 20 such towns?

No. 5.

1. Add £83,249 17s. 6¼d., £9,764 13s. 8½d., £436 19s. 10¼d., £8,649 15s. 8½d., £946 13s. 10¾d.
2. From £21,010 10s. 0¼d. take £19,019 19s. 11½d.
3. Divide 479,603 by 86.
4. Take 1,200 half guineas from 950 guineas.

No. 6.

1. Add £64,237 18s. 4¼d., £39 15s. 4½d., £8,357 15s. 9¾d., £93,278 13s. 7½d., £438 2s. 10¼d., £6,438 16s. 6¾d.
2. From £29,010 13s. 1½d. take £898 17s. 11½d.
3. Divide 6,201,509 by 87.
4. What is the difference between 789 multiplied by 54, and 2,367 multiplied by 18?

No. 7.

1. Add £21,307 9s. 7¼d., £40,233 13s. 9d., £57 9s. 7¼d., £637,942 18s. 9½d.; £17,471 16s. 2¾d.; £794,004 12s. 11½d.
2. From £69,009 0s. 0¾d. take £30,013 14s. 6¾d.
3. Divide 400,794 by 576.
4. How many times may 374 be taken from 9,350?

No. 8.

1. Add £43,190 9s. 4¾d., £758 11s. 7½d., £79,464 19s. 7¾d., £68,575 13s. 10½d., £96,739 18s. 6¼d., £48,797 11s. 10¾d.
2. From £34,026 13s. 0½d. take 19,019 17s. 8¾d.
3. Divide 739,694 by 842.
4. What is the result, when 94,786 is multiplied by 96?

No. 9.

1. Add £90,017 18s. 6¼d., £4,041 13s. 9½d., £93,217 13s. 5¾d., £73,073 17s. 7d., £23,230 12s. 11½d., £3,033 13s. 3¾d.
2. From £67,906 19s. 7½d. take £19,019 19s. 11¾d.
3. Divide 763,875 by 375.
4. In an army of 24,000 men, 2 out of every 10 men were killed in battle. How many were left?

No. 10.

1. Add £89,004 10s. 0¾d., £4,019 0s. 7½d., £60,011 19s. 4¾d., £70,070 17s. 7d., £8,080 0s. 9¾d., £30,004 16s. 8½d.
2. Divide 476,974 by 563.
3. Add £94,007 9s. 3¾d., £590 13s. 4¾d., £67,017 19s. 2½d., £900,090 18s. 11d., £64,913 17s. 9¾d., £7070 15s. 7½d.
4. Take £19,019 19s. 11½d. from £201,102 13s. 3¾d.

No. 11.

1. Add £4692 18s. 7½d., £63,587 13s. 11¾d., £945 16s. 7¾d. £7,394 18s. 8d., £4,269 17s. 10½d.
2. From £10,010 13s. 3¾d. take £9,067 14s. 11½d.
3. Divide 642,395 by 86.
4. A baker makes 750 loaves daily. How many is that in two years of 365 days each?

No. 12.

1. Add £6,249 17s. 8¾d., £963 14s. 7½d., £85 19s. 8¾d., £6,793 14s. 11¾d., £829 16s. 10½d.
2. From £13,011 11s. 11¾d. take £6,024 17s. 11½d.
3. Divide 98,768 by 86.
4. What is the result when 74,679 is multiplied by 76?

No. 13.

1. Add £42,654 13s. 8¼d., £4,937 18s. 6½d., £432 17s. 11¾d., £5,264 19s. 11½d., £68 14s. 2d.
2. From £18,010 10s. 1½d. take £4,961 17s. 10¾d.
3. Divide 245,967 by 196.
4. What is the difference between 9 times 14,014 and 8 times 11,011?

No. 14.

1. Add £8,946 16s. 3½d., £863 14s. 7¾d., £97 18s. 11½d., £6,739 19s. 10¾d., £5,210 18s. 6½d.
2. From £41,019 13s. 6½d. take £27,029 15s. 8¾d.
3. Divide 94,698 by 96.
4. A book contains 84 pages, on each page are 702 letters. How many letters in 5 such books?

No. 15.

1. Add £4,629 18s. 3¾d., £96 14s. 7½d., £794 19s. 11¾d. £7,968 17s. 4½d., £5,247 13s. 3¾d.
2. From £19,019 10s. 1¾d. take £8,074 13s. 7½d.
3. Divide 468,296 by 97.
4. An army consisted of 848,488 men. In war ⅓ of these were killed and a ¼ died of sickness. How many were left?

No. 16.

1. Add £64,973 18s. 4¼d., £378 19s. 11½d., £8,569 13s. 3¾d., £87,594 17s. 10d., £468 15s. 8½d., £45,392 17s. 5¾d.
2. From £15,001 1s. 1¾d. take £99 18s. 7½d.
3. Divide 5,901,043 by 86.
4. What remains when 79 is taken 24 times from 784,293?

No. 17.

1. Add £19,048 13s. 7¼d., £986 16s. 10½d., £8,695 15s. 8¾d., £26,349 18s. 6½d., £9,783 17s. 11½d.
2. From £41,210 10s. 1½d., take £19,120 14s. 7¾d.
3. Divide 249,673 by 186.
4. A book contains 96 pages, on each of which are 4,076 letters. How many letters are there in the book?

A Course of Object-Lessons and Elementary Science.

(Adapted to the Syllabus of the New Code and of the London School Board.)

BY RICHARD BALCHIN,

Head Master under the School Board for London.

It may perhaps be thought that I am treating this subject of the classification of vertebrate animals in a manner too advanced for third-standard boys. But I can assure the reader I have found, from actual experience, that ordinary boys of this grade are not only quite capable of grasping all I have laid before them, but are most interested in the subject. It is, of course, necessary that the teacher must himself be well up in natural history in order to present the question in an absolutely accurate, though quite elementary, manner. How extremely interesting and instructive, for instance, would a lesson, even a most elementary lesson, be, upon the gradual development of the organ of circulation throughout the five classes into which we group the sub-kingdom vertebrata! Draw on the blackboard a diagram, not necessarily a picture, of the heart of the lowest fish, with its *one* chamber. Write over the drawing the figure one. By the side of this, make a diagram of the heart of an ordinary fish with *two* chambers, auricle and ventricle. By this, over which write the figure two, draw a diagram of the heart of a frog with its *three* chambers, two auricles and one ventricle. Write over this the figure three. Now let there be a diagram of the heart of a member of the class 'reptiles,' with its two auricles, and the one ventricle almost divided into two parts by the growth of an incomplete septum. Write over this the figure four. Finally draw a diagram of the heart of a bird or a mammal with its four chambers. Of course we cannot in this standard show the valvular difference between the heart of a bird and of a mammal; only say, there *is* a difference. Does not the reader see what a capital way this is of introducing to these little boys the grand law of evolution?

Continuing our notes we have:—

Vertebrate Animals:—Amphibians.

6. Have ready pictures of a frog, toad, newt, salamander, and tadpole. Talk about the pictures. Get from the boys all they know about a frog or a tadpole. Most boys know a good deal about them. They will tell you the tadpole will become a frog, and that frog's spawn becomes tadpoles; also that a frog feels very cold to the hand. Very likely some of the boys have heard of amphibious animals. If so, they will tell you the seal, walrus, crocodile, and hippopotamus are all amphibians because they are found both in water and on land. The first thing the teacher has to do here is to correct any errors that have got into the boys' heads, then arrange the facts they already possess, and supplement with a little additional accurate information.

The term amphibian is not applied to an animal that can live on land and in water. The word means 'both lives,' and is given to those vertebrate animals who in the first stage of their existence are true fish, and in the second stage are reptiles. The tadpole is a fish. By means of gills it breathes the air dissolved in water, and has a heart with two chambers. As a frog, it is a reptile with lungs for breathing as we do, and has a heart of three chambers—two auricles and one ventricle. Talk about other interesting features connected with the structure of the frog, such as the 'web' foot formed for swimming. The frog finds its food in water. It is a good swimmer. Boys may learn something of the art of swimming by watching how a frog draws in and strikes out its hind legs. It is also quite perfect as a diver.

Vertebrate Animals:—Reptiles.

7. Have ready one of the charts showing the various members of this class. If possible a stuffed snake or crocodile. Carry on a conversation about the pictures. It will soon be discovered that the boys think the only reptiles are serpents and snakes. Some will have it that worms are reptiles. Settle this error by showing that worms are not vertebrate animals at all; they have no backbone. The reptiles are (1) crocodiles and lizards; (2) snakes; (3) tortoises and turtles. Draw upon the board a diagram of the heart of a frog with its three chambers as described in a previous lesson. By the side of it draw a diagram of the heart of an ordinary reptile; but make a line halfway down the one ventricle to show that there is a sort of beginning of a double ventricle. This is the kind of heart possessed by turtles, tortoises, snakes, and lizards, and the circulation is as follows:—impure blood from all parts of the body enters the right auricle, passes to the ventricle, then to the lungs, where it meets with the inspired air and, giving up its impurities, returns through the left auricle to the one ventricle where there is thus a mixture of pure and impure blood which is distributed over the body. All this can be shown on the blackboard by means of arrows. In the case of the crocodiles, this incomplete division of the ventricle is perfected, so their heart is of *four* chambers. Here is a good opportunity of explaining to the boys what is meant by saying, such and such an animal is *low* in its class, and another is *high*. These terms signify an approach to the class below, and the class above, respectively. For instance, the turtles, in organic structure, come near the amphibians and fish; while the crocodiles are closely united to birds. The respiration of reptiles is by lungs only. At no period of their existence do they possess gills. If the boys in this standard are above the average, the teacher may more fully describe the process of respiration and its effect upon the air.

Vertebrate Animals:—Birds.

8. Have ready all the available pictures of birds. Also a diagram of the internal organs of a bird. If possible, a fowl for dissection. Hold a conversation with the boys about the pictures. The children will observe from these pictures that some birds have very powerful, large wings; others little or no wings and cannot raise themselves above the ground. Some have web feet; others, strong talons. Get from the boys what they know about birds. It will soon be seen that the boys' knowledge of birds is derived mostly from observing the hens which their fathers keep in the back yard; and that the most important characteristic of birds is that they lay eggs. Seize upon this latter fact to explain that all the vertebrate

animals we have hitherto spoken of lay eggs. Fish, amphibians, reptiles, and birds, all produce their young from an egg. Some boys may have caught a sparrow and observed the rapid pulsation of the little frightened creature's heart. Draw on the board the heart of an ordinary reptile with its three chambers; and by the side of it, that of a bird with its four chambers. Show, by means of arrows, how this circulation is carried on. Birds breathe the air as *we* do, by lungs. If the boys have seen their mothers truss fowls, they must have noticed that the 'lights' or lungs have to be *torn* away from the ribs; while the lungs of other animals, such as those of the sheep or ox, are taken away whole. *Their* lungs, like ours, are suspended freely in the chest. Recapitulate the process of animal respiration and its effect upon the air.

(To be continued.)

—o—

The 1891 Scholarship Examination.

BY DR. GEORGE BEACH, M.A.

Co-Author of 'A Manual of our Mother-Tongue,'
Author of 'Elements of English,' 'Entertaining Readers.'

HOW TO STUDY ENGLISH.

THE study of English is comparatively speaking quite a modern branch of learning. Formerly, whilst an educated man would have been ashamed to own his ignorance of a critical knowledge of Latin and perhaps Greek, he thought that enough was known about his MOTHER-TONGUE if he had a fair knowledge of its literature, and could understand the general principles of its structure by his knowledge of the Grammar of the ancient classics.

Many facts could be evidenced in support of this statement. The great Dr. Johnson felt himself thoroughly equipped for his dictionary compilation by his acquaintance with the dead languages of the Græco-Latin Stock, despite the fact that English is a Teutonic Language; and the ignorance respecting the origin of the possessive inflection of nouns, and the birth of the word '*its*' strongly corroborate our assertion.

It was gravely maintained by scholars that the phrase '*God's love*' was a contraction of '*God his love*,' and this error has been recorded and perpetuated in our Prayer Book, where, in Dr. Peter Gunning's '*Prayer for all sorts and conditions of men*,' the concluding sentence runs '*And this we beg for Jesus Christ his sake.*'

To the very recently deceased Dr. Morrel the *popularisation* of the study of English is mainly due. He compiled an 'English Grammar and Analysis' which was the first attempt at a scientific and accessible manual for the masses, and he showed the way which many men of greater attainments and scholarship have broadened and rectified. But here a word of caution is necessary. Much good as Dr. Morrel's book has wrought, it is now distinctly behind the times, and should not now be esteemed suitable for the government examinations.

According to the foregoing remarks, it is plain that English should be studied from a Teutonic standpoint. True, it has a most composite vocabulary, and has laid under contribution almost every language under the sun; but what it has absorbed it has assimilated, and its large and diverse foreign element has not been suffered materially to influence its structure. The servitude of the Briton, and the dominion of the Roman and Norman have been powerless to affect its nature.

Max Müller says: 'It is indifferent by what *name* the language spoken in the British Islands be called, whether English or British or Saxon; to the student of language, ENGLISH IS TEUTONIC AND NOTHING BUT TEUTONIC. Though every record were burned, the English Language as spoken by any ploughboy would reveal its own history, if analysed according to the rules of Comparative Grammar. Without historical help we should see that English is of the Low German Branch of the Teutonic Class of the Aryan Family.'

Even that portion of our language which has been most affected by alien influence will nevertheless confess its birth. Our dictionaries now contain about 38,000 words (exclusive of Past Tenses and Past Participles), and of this number about 23,000 have been found to be derived from Saxon.

But, besides all this, the Articles, Pronouns, Prepositions, Conjunctions, and Auxiliary Verbs, recur more frequently than other words, and as these spring from native sources, the actual proportion of Saxon words in common use far exceeds the dictionary proportion. In the *New Testament* more than 92 per cent. of the words, in Tennyson's '*In Memoriam*' more than 90 per cent., and even in Ruskin's '*Modern Painters*' more than 72 per cent. are Saxon.

WEEK COMMENCING 27TH APRIL, 1891.

DAYS.	FIRST HOUR.	SECOND HOUR.	THIRD HOUR.
M.	Problems leading to Simple Equations, *or* Ingredients of Food.	Dates from 1688 A.D to 1715 A.D.	Latin (see Mr. Huxley's Articles), *or* French (see Article).
TU.	Euclid Book I. to Prop. 34, *or* Flannel Sampler.	General Map of Australia.	Science.
W.	Theory of Proportion.	Drawing.	Analysis and Parsing.
TH.	Algebraic H.C.F. and L.C.M., *or* Preparation of Food.	History from 1715 A.D. to 1745 A.D.	Latin *or* French.
F.	Deductions on Euclid Book I., *or* Flannel Sampler.	General Geography of Australia.	Science.
S.	Mensuration of Quadrilaterals *or* Simple & Compound Proportion.	Revise History of Saxon Period.	How to teach Writing.	Saxon Affixes " Prefixes " Roots.

REMARKS ON ROUTINE.

(*a*) Where the work for men and women is different the lower half of the rectangle is dedicated to the latter.

(*b*) Six copies each of large and small hand should now be written per week.

(*c*) The services of a friend should be utilised to give out the Dictation.

(*d*) SIMPLE EQUATIONS.

Hamblin Smith, Example XXXIII., pp. 62 to 66, sums 4, 7, 10 to 37, *or*

Charles Smith, Example XVII., pp. 67 to 71, sums 9, 13, 17 to 53, *or*

Todhunter, Example XXII., pp. 128 to 135, sums 9, 14, 19 to 59.

H.C.F. (or G.C.M.) AND L.C.P. (or L.C.M.).

Hamblin Smith, pp. 70, 71, Article 128, and pp. 88 and 89, *or*

Charles Smith, pp. 109 to 111, Articles 112, 113, and pp. 116 to 119, *or*

Todhunter, pp. 55 to 61, Articles 97 to 114, and pp. 63 to 66.

(*e*) EUCLID.
Deighton.—(1) to p. 61 (Props.), (2) to p. 61 (Deductions).
Todhunter to p. 39, (2) Exercises 33, 44, 66, 77, 93 and 94, pp. 342 to 347.
(*Scotch Code.*) Finish Third Book.

(*f*) ARITHMETIC.
Males, Pendlebury.—pp. 185 to 188, and 190, 191.
Females, Dixon and Beach.—(1) pp. 121 to 129, (2) Example XXIV. p 129, Example XXIX. p. 147, sums 16 to 20 in each.

(*g*) HISTORY.
(1) Dates in *Curtis* from 1688 to 1715.
(2) *Sanderson.*—pp 297 to 309.
Ross.—pp. 314 to 359.
(*Scotch Code.*) The Tudor Dynasty (in outline).

(*h*) GEOGRAPHY.
Anderson.—pp. 200 to 205.
Moffatt.—pp. 189 to 201.
(*Scotch Code.*) General Geography of Asia.

(*i*) ENGLISH.
Analyse the following passages, supplying the words that are understood :—
(1) She reads slowly *but very* distinctly.
(2) He is *taller than* I am.
(3) *Come as* soon *as possible.*
(4) *Others* said 'He is *like him.*'
Also parse the italicised words.

(*j*) LATIN.
Read Mr. Huxley's Article and Chapters 34—43 of '*De Bello Gallico.*'

FRENCH.
Master pp. 106 to 113 of *Professor Darqué's French Course* and pp. 46 to 56 of '*La Jeune Sibérienne,*'

(*k*) INGREDIENTS OF FOOD.
Hughes's Domestic Economy.—pp. 263 to 269.

SELECTED GOVERNMENT QUESTIONS.

1. Solve the equations :—

(*a*) $$\frac{x+3y}{4}+\frac{3x+y}{12}=11$$
$$x+y=8(y-x)$$
Ans. $y=9$; $x=7$.

(*b*) $$\frac{2x-3}{x-2}-\frac{1}{2}+\frac{2x-1}{1-x}=0.$$
Ans. $x=-1$ or $+4$.

2 (*a*) Divide $2x^4+12x^3+26x^2+24x+8$ by x^2+3x+2.
(*b*) Break into factors $21a^2-40x-21$
$$143x^2+8x-16$$
$$x^3-2x^2+2x-1.$$
Ans. $2x^2+6x+4$; $(7x+3)(3x-7)$; $(11x+4)(13x-4)$; $(x-1)(x^2-x+1)$.

3. The circumference of a field is 252 yards. If the field be worth £48 16s., find the value of a similar circular field whose circumference is 315 yards. Ans. £76 15s.

4. Multiply £5 4s. 6½d. by 365, and explain each step as you would to a class. Ans. £1,907 10s. 1½d.

5. £52 18s. is made up of half-sovereigns, half-crowns, and sixpences in the proportions of 3, 5 and 7. How many coins are there? Ans. 345.

6. A person has £2,725 stock in the 3 per cents. He sells out at 99½ and buys 3½ per cents. at 109. Find, neglecting brokerage, the alteration in his income. Ans. £5 6s. 3d.

7. (*a*) The angles at the base of an isosceles triangle are equal to one another, and if the equal sides be produced, the angles on the other side of the base shall be equal.
(*b*) The straight line which bisects the base of an isosceles triangle at right angles shall pass through the vertex.

8. (*a*) From the vertex of an isosceles triangle a line is drawn to any point in the base. Prove that the square on the side of the triangle is equal to the square on the line so drawn, together with the rectangle contained by the segments into which the base is divided.
(*b*) To construct a square equal to a given rectangle.

9. (*Scotch Code.*)—(*a*) The angle in a segment of a circle greater than a semi-circle is less than a right angle.
(*b*) A triangle whose angles are in the ratio of 1 : 2 : 3 is inscribed in a circle. What regular figures can be inscribed in a circle having a side of the triangle for one of the sides of the figures?

10. Give a brief account of Warren Hastings' government of British India. On what grounds was he impeached by Parliament?

11. Write a short life of George Washington. What causes have modified the enmity with which the English and Americans regarded each other at the close of the 'War of Independence?'

12. Name, in order, the chief victories of Nelson. Give a short account of the battle of Trafalgar, and point out its political results.

13. (*Scotch Code.*) Give a brief life of some 'Scottish Worthy' of the 16th century. What was the Scotch system of schools established at the Reformation?

14. Describe the empire of Brazil. What occurrences led to the emigration of the Royal family of Brazil from Portugal. What is the kind of Government at present?

15. (*Scotch Code.*) To what primary causes do you attribute winds? Explain the difference between 'permanent,' 'periodical,' and 'variable' winds. State the different localities in which these different words prevail.

16. Describe the colony of New Zealand. Give some account of its native race, its minerals, and volcanic phenomena.

17. Give the meanings of the prefixes *extra-, ob-, be-, for-, anti-.* What do the suffixes *ster, -ish, ant, -let, -al* denote respectively? Give one example in each case.

18. Analyse fully the following passage, and parse the words printed in *italics* :—
'When Henry *the Eighth* attempted to raise a forced *loan* of unusual amount by proceedings of unusual rigour, the opposition *which* he encountered was such *as appalled even* his stubborn and imperious spirit.'

19. Show what is the proper use of a blackboard as an aid to recapitulation. Give a specimen of the sketch which should appear on the board at the end of an object lesson.

20. Explain what may be done by the help of reading-books to impart geographical and historical information in schools in which geography and history are not taken as class-subjects.

21. (*For Infant Teachers.*) '*It should be borne in mind that it is of little service to adopt the* "GIFTS" *and mechanical occupations of the* KINDERGARTEN, *unless they are so used as to furnish real training in accuracy of hand and eye, in intelligence, and in obedience.*'

22. On what grounds can a diet consisting wholly of vegetable food be defended? What objections to it can fairly be urged, and to persons of what class or age are such objections applicable?

23. What dangers to health are likely to accrue in a school where there are no lobbies or perches for clothes, and where the desks are flat, occupy nearly all the floor space, and face the windows?

24. Write six lines of the Large hand copy, '*Psychological.*'
" " Small-hand copy, 'Purity is the feminine, Truth the masculine, of Honour.'

25. DICTATION :

On the morning of May 31st, | 1533, | the families of the London citizens | were stirring early | in all houses. From Temple Bar to the Tower, | the streets were fresh strewed | with gravel, | the footpaths were railed off | along the whole distance, | and occupied on one side | by the guilds, | their workmen | and apprentices | on the other | by the city constables and officials | in their gaudy uniforms. | The principal streets | had dressed their fronts | in scarlet and crimson, | in tapestry and in cloth of gold. | The sheriffs were pacing up and down | on their great Flemish horses, | hung with liveries, | and all the windows | were thronged with ladies | to see the procession pass. | Twelve French knights | came riding foremost | in coats of blue velvet. | After them followed | a troop of English gentlemen. | Next, the abbots passed on, | mitred, | in their robes, | the barons followed in crimson velvet, | the bishops then, | the earls and marquises, | the dresses of each order | increasing in elaborate gorgeousness. | Afterwards came the Lord Mayor | with the city mace in hand, | and the officers | of the Queen's household.

(To be continued.)

PUPIL TEACHERS' LATIN COURSE.

BY L. HUXLEY, B.A.,

Classical Master Charterhouse School.

This New Latin Course (specially written for Scholarship Candidates) was begun in our issue of February 7th (No. 4., vol. XI.).

Exercise XXIV.

1. Venātor per tōtum diem illam rēgiōnem pĕrăgrātŭs (dep.) ad hospĭtium, ŭbī diē sŭpĕrĭōrē dēvertĕrat, sīnē praedā rĕdīrē nōluit. 2. Nam caupōnī multā dē vēnātiōnē suā praedĭcāvĕrat, sē enim omnē gĕnŭs et vŏlūcrum (note 3 on cons. decl.) et quadrŭpēdum vēnātum esse, domī perdĭcēs et cervōs, in Africā leōnēs, in Indiā pāvōnēs et ēlĕphantes. 3. Sē indē multum ēbŭr idōneum rettŭlissĕ. 4. Săgittārium quŏquĕ sē optĭmum esse, neque quidquam sagittīs nōn attingĕre.

Translation.—1. A hunter, having traversed that district for a whole day, was unwilling to return without game (lit., spoil) to the inn where he had lodged (lit., turned in to) the day before. 2. For he had talked a great deal to the innkeeper about his hunting; for he had hunted (so he said) every kind both of birds and of beasts, at home partridges and stags, in Africa lions, in India peafowl and elephants. 3. Thence he had brought back home much ivory. 4. He also was (he said) a very good archer, and did not fail to hit anything with his arrows.

Grammatical Notes.—1. From the stem *vēnā*, hunt (deponent), are formed *vēnā-tor*, hunter, and *venā-tio*, hunting; *per totum diem*, the accusative (with or without a preposition) expresses *duration* of time where the abl. *diē sŭpĕrĭōrĕ* expresses *point of time* or *time within which*. 2. *Se—venatum esse.* His actual words were, *ego vēnatus sum.* In reported speech the subject from Nom. becomes Acc., the principal verb from finite becomes *infinitive*. *Elephant-* forms Nom. *elephās*. There is another form, *elephanto-*. 3. *Rettulisse*, perf. infin. act. *Rettuli* is used as perf. of *re-fĕro*. 4. *Neque*, 'neither,' or 'and—not.' *Quidquam*, a compound of *quis*, indefinite, only used after a negative expressed or implied. The *quam* is not declined. *Attingere*, hit, reach; *non attingere*, fail to hit.

Retranslation.—1. An innkeeper was unwilling that a hunter, a man of fierce (*fĕro-a-*) looks (*fācie-*, sing. F.), should put up at (*ād* + acc.) his inn. 2. So (*ītăque*) he talked a great deal about the scarcity (*paucĭtāt-*, F.) of wild-beasts (*fĕra-*, Pl.); for (he said) the hunting in his-own fields (*agro*, M.), both of birds and beasts, was better than in the woods (*silva-*) of that district. 3. Formerly (*ōlim*) (he said) a host (*multĭtūdŏn-*) of partridges, stags, and smaller (*mĭnŏr-*) quadrupeds had lived there (*ībi*).

Note.—In Latin you may say partridges *and* stags *and* quadrupeds, or partridges, stags, quadrupeds; but you may not put in one 'and' only at the end of a list as in English.

Exercise XXV.

1. Vespĕrī ad stagnum pervēnit, super quŏd ansĕrum et ănătum magnă mullĭtūdō nătābăt. 2. Pŭĕrō cuīdam, qui in aggĕrē prŏpē sēdēbăt, oblātă pĕcūniă, 'Heus tu,' clāmăt, 'lĭcetnĕ mihĭ hīs quattuor sestertiīs unum ex istīs ansĕrĭbus jăcŭlarī?' 3. Puer, pecūniă acceptă, 'Per mē lĭcĕt,' respondet. 4. Tum vēnātor, tēlō ēmissō, ansĕrem quem vīdēt maxĭmum interfĭcit. 5. Simŭl pŭĕr hīs verbīs effŭgit; 'Cāvē; ădest agrĭcŏlă, cūjus sunt hī ansĕrēs.'

Translation.—1. In the evening he came to a pond, upon which a great number of geese (M.) and ducks (M.) were swimming. 2. Offering (some) money to a (= certain) boy, who was sitting on the dam close by, 'Hallo,' he cried, 'may I shoot one of your geese for these four sesterces?' 3. The boy, taking the money, replies, 'as far as I am concerned you may.' 4. Then the hunter, letting fly a dart, kills the biggest goose he sees. 5. At-the-same-moment the boy makes off with these words: 'Look out; here is the farmer whose geese these are.'

Grammatical Notes.—1. *Vesperī*, locative; another form, following the consonant decl., is *vespĕrĕ*; *quĭdam*, 'a certain,' 'a' compound of *quī*. 2. *Licet*, impersonal verb; the subject is the Infinitive clause, the ind. obj. is in the dative; the enclitic *-nĕ*, added to the first word of a clause, asks a question; *istī*, demonstrative pron. 'that,' by you, of yours; *quattuor* (numerals from 4—100 inclusive are indeclinable); *sestertiīs* (M.), abl. of price. Note the various ablatives absolute, and how the *pass.* past participle of the Latin, agreeing with the *object*, idiomatically represents the English active part. agreeing with the *subject*.

Retranslation.—1. In the evening the hunters saw (*vīdĕ*, pf. *vīd-*) many (*multo-*) ducks and geese. 2. Ten (*decem*) geese were swimming among (*inter*, acc.) a great number of ducks. 3. 'May we shoot one of these birds?' cried a hunter. 4. With these words, letting fly an arrow (Ex. xxiv.), he shot the biggest goose he saw. 5. 'Hallo,' cried the farmer, who was standing (*stā-*) on the dam, 'you must buy (tr. by gerundive, *ēmendŭs est vōbīs*, dat.) the goose you have killed for ten sesterces.' (N.B.—What word does the English omit after 'goose'? The relative must be expressed in Latin.)

Exercise XXVI.

1. Erant quondam dŭō frātrēs, alter dīvēs, alter paupĕr. 2. Dives, qui mājor ĕrat, rem maxĭmam hăbēbat ĕt ā pātrē rĕlictam et ā princĭpē quŏdam, cūjus āmīcĭtiam cōmĭtātē et lĭbĕrālĭtātē sĭbī adjunxĕrat. 3. Nam maxĭmam ăpud rēgem cŏmĭtēsquĕ ējus grātiam ĭnīvĕrat, quōrum inferiōrēs mūnĕrĭbus, ădūlātiōnĕ summōs dēlectābat. 4. Frātrem autem paupĕrem spernēbat, quīă rem mĭnōrem, neque lātōs ăgrōs neque armentă neque grĕges magnōs hăbēbat, sed fundum paucōrum jūgĕrum pĕcūdesque paucās, quae aestātē lac, hiĕmē carnem praebēbant.

Translation.—1. There were once two brothers, one rich, the other poor. 2. The rich one, who was the elder, had a very large property, left both by his father and by a certain chief, whose friendship he had won (lit., joined to himself) by his courtesy and generosity. 3. For he had attained very great favour with the king and his companions, of whom he used to charm the lower with gifts, the highest with flattery. 4. But he scorned his poor brother, because he had a smaller property, and not wide fields, nor herds (o- stem), nor large flocks, but a farm of few acres and a few cattle, which provided milk in summer and meat in winter.

Grammatical Notes.—2. *Mājor*, sc. *natu*, greater 'by birth,' older; so *mĭnor* (*nātū*) = younger. The Comparative is formed by adding *iōr* to the last consonant of the stem of the adjective; the Superlative, by adding *issĭmo-*: as *lātus*, broad; Comp. *latior*, Superl. *lāt-issimus*. If the adjective ends in r, the Superl. termination is *-rĭmo-*, as *pauper, pauper-ior, pauper-rimus*. The comparison of *magnus*, great, is formed from a stem *mag-*; mag-ior = *major*, and mag-simus = *maximus*. *Parvus*, small, is compared from the stem *min-* (cp. *minu-o*, I make less) *mĭnor, mĭnĭmus*.

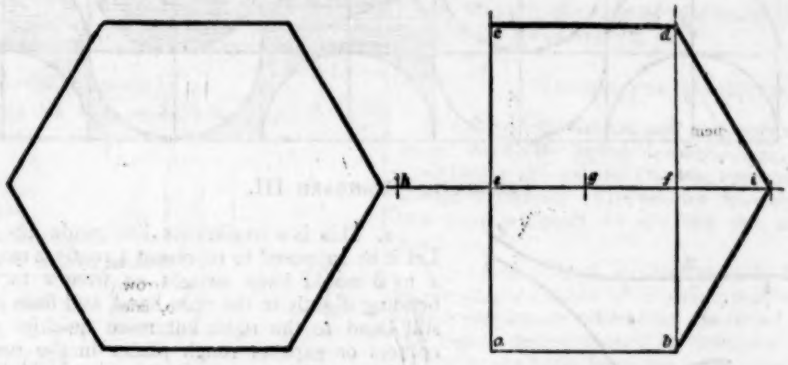
Retranslation.—1. The largest field of the poor brother was smaller than (*quam*) the smallest field of the rich farmer's. 2. The number (*nūmĕrus*, M.) of cattle (pl.) which they grazed (*pasc-o*) over (*per* + acc.) a few acres was very small (superl.). 3. The flock and herd of the richer (*dīvīt-* often contr. *dīt-*) men (omit) provided wool (*lāna-*), milk, and (note Ex. xxiv.) flesh, both in spring (*vēr-*, N.) and in the other (*cētĕro-*) times of the year (*anno-*, M.). 4. With these gifts they won the friendship of the king's companions.

(To be continued.)

Teachers' Notes of Drawing Lessons for Standard III.*

By an Art Teacher under the London School Board.

Hexagon.

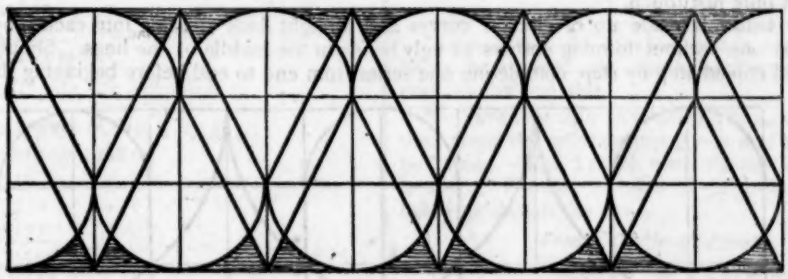


18. Copy. 18. Work.

Draw the base line *ab* and two perpendiculars *ac, bd*. The height is *not quite twice the base*. Mark the middle points of the upright lines and draw a line through *e* and *f*. The centre of *ef* is at *g*, and the side pieces *eh* and *fi* are equal to the middle pieces *eg* and *gf*, making along the middle line four equal parts. In enlarging, be careful about the proportion between the height and the base.

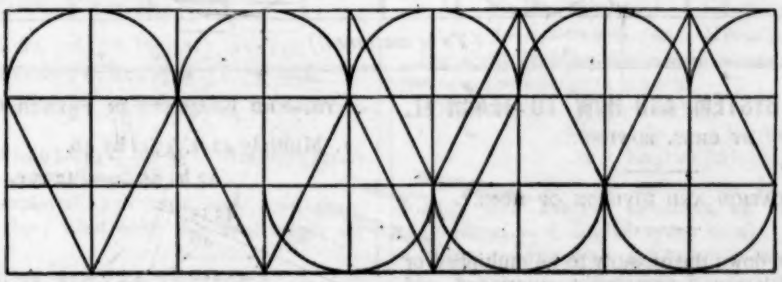
Running Pattern.—Kites.

Straight lines ruled—half circles freehand.



19. Copy.

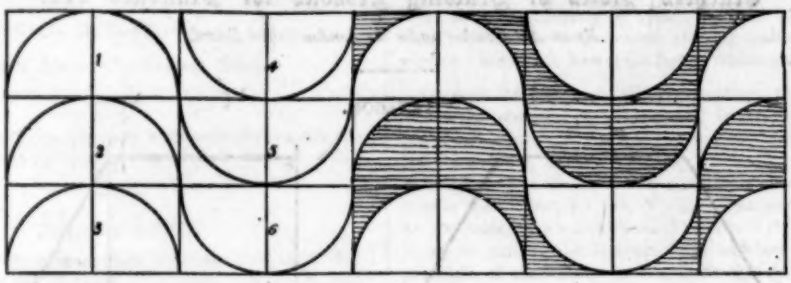
Draw horizontal and vertical lines an inch apart, forming three rows of squares (twice size of copy). Draw a row of kites each consisting of a half-circle and two straight lines. Then turn the paper up-side-down and draw another row alternating with the first row.



19. Work.

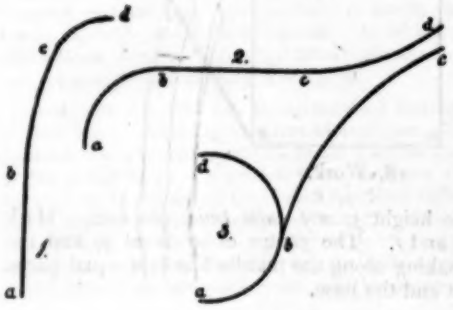
* The Teaching of Drawing becomes compulsory on September 1st, 1891. These articles will be specially helpful to teachers who know but little of the subject. They will teach them how to teach it successfully.

Half-circles, draw 1, 2, 3, then 4, 5, 6 the reverse way, and so on.



20.

FREEHAND.—STANDARD III.



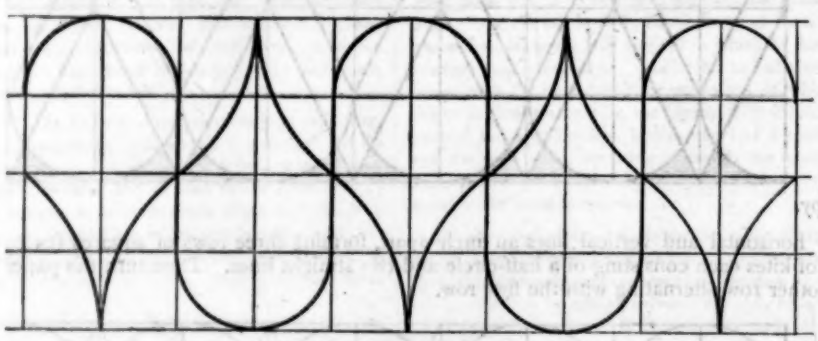
21.

1. This is a continuous line made up of three parts. Let it be supposed to represent a road—a man walking from *a* to *b* would keep straight on, from *b* to *c* he would be bending slightly to the right hand, and from *c* to *d* he would still bend to the right, but more quickly. There are no corners or gaps or rough places in the road to hinder or stop him. The first part *ab* is a straight line, the second part *bc* a piece of a large circle, and the third part *cd* a part of a small circle.

2. *ab* is part of a small circle turning to the right, *bc* is straight, *cd* is part of a large circle bending to the left.

3. From *a* to *d* the curve bends steadily to the left, but to get to *c* the left hand turn must be changed into the right-hand at *b*. The small circle that makes *ad* and the large circle forming *bc* do not cut across each other, but only just touch.

The copy below is made up of circular curves and straight lines running into each other so that they would join into one without forming corners or ugly bends in the middle of the lines. Should be drawn on black-board and copied step by step, completing one series from end to end before beginning the other.



22.

(To be continued.)

THE METRIC SYSTEM, AND HOW TO TEACH IT.

BY CHAS. BOWDEN.

MULTIPLICATION AND DIVISION OF MONEY.

Rule.—Write down the quantity to be multiplied or divided in the lowest denomination mentioned, and proceed as in simple multiplication or division. The product or quotient will be in this denomination. If required, mark off in the answer the different denominations.

WORKED EXAMPLES IN FRENCH CURRENCY.

1. Multiply 42 fr. 35 c. by 46.

42 fr. 35 c. = 4235 c.

4235
46
25410
16940
194810 centimes.

= 1948 fr. 10 c. Ans.

2. Divide 736 fr. 3 c. by 91.

736 fr. 3 c. = 73603 centimes

91)73603(808 centimes
728
803
728
75

= 8 fr. 8$\frac{75}{91}$ c. Ans.

Worked Examples in United States Currency.

3. Multiply 84 dol. 17 cents by 72.

84 dol. 17 c. = 8417 c.

8417
72
16834
58919
606024 cents.
= 6060 dol. 24 c. Ans.

4. Divide 713 dol. 95 c. by 5.

713 dol. 95 c. = 71,395 cents

5)71395
14279 cents
= 142 dol. 79 cents. Ans.

Worked Examples in Proposed English Currency.

5. Multiply £89 5 fl. 3 c. 7 m. by 19.

£89 5 fl. 3 c. 7 m. = 89537 m.

89537
19
805833
89537
1701203 mills
= £1701 2 fl. 0 c. 3 m. Ans.

6. Divide the answer of No. 5 by 573.

573)1701203(2968 m.
1146
5552
5157
3950
3438
5123
4584
539

= £2 9 fl. 6 c. 8$\frac{539}{573}$ m. Ans.

Examples for Practice.

1. Multiply 84 frs. 3 d. 5 c. by 9, 15, 23, 146.

2. Divide 73,925 fr. 7 d. 8 c. by 4, 11, 73, 956.

3. Find the price of 76 horses, each worth 456 fr. 3 d. 5 c.

4. If I paid 921,493,675 c. for 35 houses, how much was that in fr. d. and c. for each?

5. A man employed 156 men and paid them 3 dol. 75 c. per day; what were the total wages for 365 days?

6. Multiply 56 dol. 75 c. by 9, 18, 73, 365.

7. Divide a fortune of 26½ million dollars among 135 public institutions. How much will each receive?

8. What is the quotient of 3,650,925 cents divided by 365. (Ans. in dols. and cents.)

9. Multiply £56 3 fl. 5 c. 6 m. by 3, 11, 17, 85, 600, 95.

10. Divide £695 1 fl. 3 c. 7 m. by 11, 5, 76, 104, 593, 1001.

11. What is the value of 495 articles at £1 5 fl. 3 c. 5 m. each?

12. What is the cost of one horse if 395 can be bought for £195,675 3 fl. 5 c.?

Weights and Measures.

In each of the weights and measures a unit is fixed upon. Then the higher denominations are found by multiplying the unit by 10, 100, 1,000, and 10,000 as already explained. The smaller denominations are in like manner found by dividing the unit by these numbers.

The value of each denomination is known by the prefix attached to the word which stands for the unit. These prefixes are taken from the Greek language for the higher denominations or multiples of the units, and from the Latin language for the lower denominations or parts of the unit.

Thus: *Greek*—

Deca (or deka) prefixed	= 10	times the unit.
Hecto	= 100	„ „
Kilo	= 1000	„ „
Myria	= 10000	„ „

Latin—

Deci	= $\frac{1}{10}$ of the unit.
Centi	= $\frac{1}{100}$ „
Milli	= $\frac{1}{1000}$ „

In the *Metric Act* of 1864 *deca* is spelt *deka*, probably to prevent the similarity between the two prefixes *deci* and *deca*.

We have now only to know the names of the units, then prefix the syllables just given, and the tables will be formed. The French word for the unit of length is *metre*. A metre is equal to 39·3708 inches. The following then is the

French Table of Length.

10 Millimetres	= 1 Centimetre.
10 Centimetres	= 1 Decimetre.
10 Decimetres	= 1 Metre.
10 Metres	= 1 Dekametre.
10 Dekametres	= 1 Hectometre.
10 Hectometres	= 1 Kilometre.
10 Kilometres	= 1 Myriametre.

For short lengths the metre is used; for greater distances the kilometre is used.

1 Kilometre = 39370·8 inches,
or nearly 1094 English yards,
or 5 English furlongs.

For the purpose of comparison of distances in English and French measures, we may say that 8 kilometres = 5 English miles nearly.
(8 kilom. = 8752 yds.; 5 English miles = 8800 yds.)

It has been suggested that the *foot* should be the unit of length if the Metric system be adopted in England, and that one-tenth of a foot should be a decimal inch.

(To be continued.)

How to Teach School Children to Sing from the Staff Notation.

BY W. G. McNAUGHT,

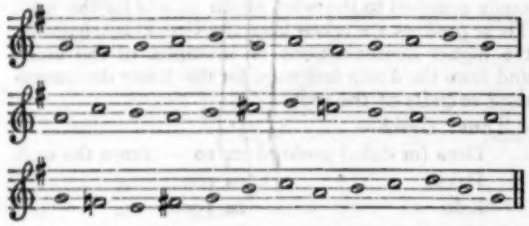
Associate of The Royal Academy of Music.

DIVISION IV.—STANDARDS V. UPWARDS.—NOTE TEST.

CODE REQUIREMENT.

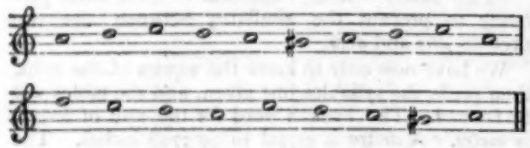
To sing slowly, using the Sol-fa syllables, from the Examiner's pointing, any simple diatonic passage in the keys of G (one sharp), D (two sharps), F (one flat), or B flat (two flats); and also a similar simple passage containing accidentals to raise the fourth of the scale (approached by the third or fifth) and to flatten the seventh (approached by the octave), properly contradicted.

Example:



Also, to sing in the same way as above described, a short passage in the key of A minor, introducing the sharpened seventh approached from and leading to the note A, but without introducing the sixth (major or minor) of the scale.

Example:



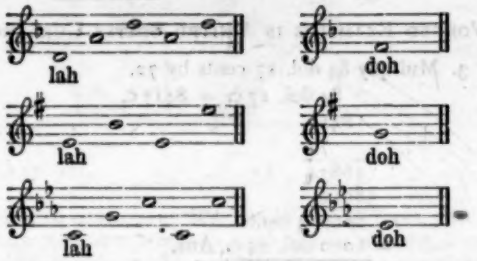
107. Methods of teaching and practising the sharp fourth and the flat seventh in all the above keys were fully explained in Sections 60 to 70 in the numbers for October and November, 1890. The new point in tune not hitherto dealt with is the MINOR MODE.

108. As the physical and psychological reasons that are advanced to explain the peculiar relations of tones to one another which, spoken of collectively, are called a *key*, are difficult matters for even adults to understand, it is certainly not advisable to inflict upon children any laboured account of the minor mode. After all the main business is to accustom their ears to the new relations. Very little theory need be impressed at first, but there should be abundant practice.

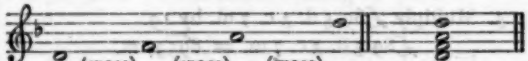
109. The first thing to do is to give practice on the chord of *Lah* (**lah, doh me lah**). As in the 'natural' key this chord is much too low for most voices it is better to begin with a higher pitch, say Key F (that is *Doh* as F), or Key G (that is *Doh* as G). For pointing on the blackboard the initials may with advantage be written as below. The first exercises are not for *reading*, but for practice of certain effects.

DOH is F. LAH is D. DOH is G. LAH is E.

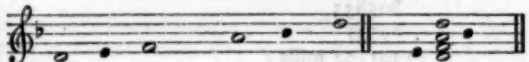
All possible variations in order should be practised in these two keys. Leaps from lah down to doh are often found difficult, the low lah being sung by mistake. As a help in this difficulty (1) show repeatedly that *doh* has now somewhat changed its effect and has become almost dreary, (2) get the class to find the *doh* after *lah*, me lah have been sung or played at various pitches.

Teacher to play or sing. Pupils to find the *doh*.

110. The other tones of the scale should now be gradually introduced, and the range from dominant to dominant (**me** to **me'** in the minor) should be practised. When about to practise the additional tones of the minor scale it will be found an advantage to write the *lah* chord with semibreves horizontally on the staff with the notes at such distances from each other as to admit of the other tones being inserted as introduced, or perpendicularly with the lah chord as a centre piece.

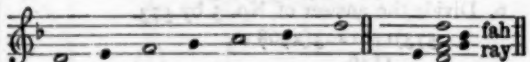
The Lah Chord.



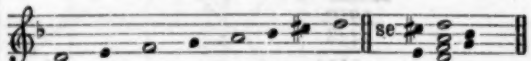
The above with te and fah added.



The above with ray added.

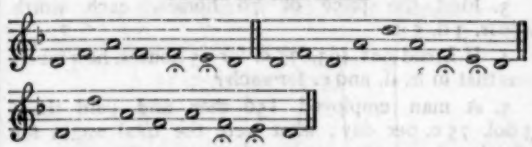


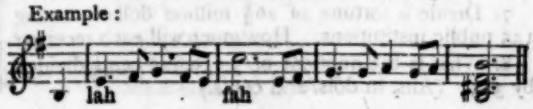
The above with se added.

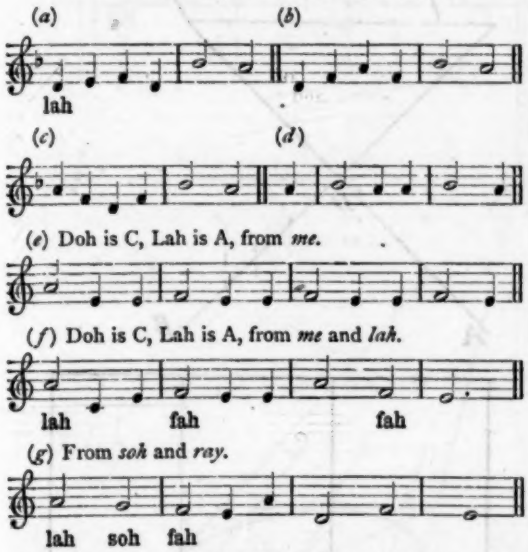


On such diagrams the teacher should point forwards and backwards, or up and down as required.

111. The *second* of the minor scale (te) helps to emphasise the effect of *lah* if it comes between doh and lah, and while the impression of the *lah* chord is fresh on the ear. The *downward* suggestion of *te* is then easily felt.

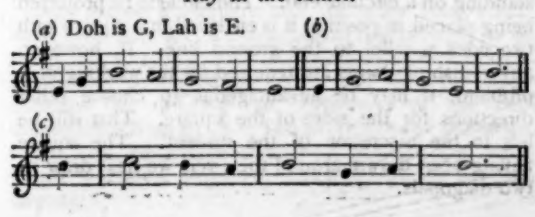
Te and the Lah chord.

112. The sixth of the minor scale (*fah*) has a marked effect, more especially when approached by leap.

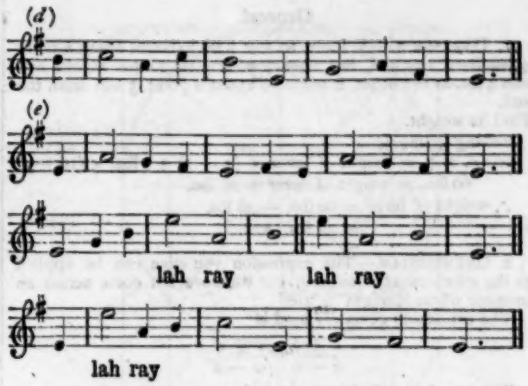
Example:

It will be observed, however, that the Code requirement expressly excludes the use of this tone of the minor scale from tests at the examination. This is because it is so easy for the inexperienced to fall into great difficulties in freely using this tone in extempore exercises. It was felt to be quite enough to require only the easiest minor mode passages as a sight-singing test. But the tone is wanted so often in songs that employ the minor mode that it would be absurd to keep a class entirely ignorant of it. Sight-singing is not everything. The greatest danger with regard to fah in the minor is that pupils are apt to strike it too flat when it is approached from above, and to disagreeably slide to it when it is approached from below. Extreme care should be taken to prevent these tendencies from becoming confirmed habits. With these reservations the following exercises may be practised.

Exercises on *fah* in the minor mode.

These minor mode phrases should be (*a*) patterned by the teacher and imitated by the class, (*b*) sung from a horizontal or a perpendicular diagram of the scale in use (see sec. 110), the teacher pointing, (*c*) sung by the pupils without a pattern, (*d*) sung from a blackboard copy written out in time, etc., as is given above. The phrases are written in rhythm because it is much easier to bring out the effect of a tone by accent than by unrhythmical exercises.

113. The fourth of the minor scale *ray* requires special study in its new conditions. It is true that, so far, the surroundings of *ray* as well as of the other tones are the same as in the major key. But the importance now given to *lah* by the frequent use of its chord (l, d m) and the strange weird change that comes ouer all the other tones, is felt in this place in the scale almost as strongly as anywhere. It is found to be easy to sing *ray* from the *me* and the *fah* above, or from the *te* and the *doh* below, but difficult from the *lah* below and the lah above.

Ray in the Minor.





The above to be patterned, etc., as before.

114. The seventh of the minor scale presents special points for consideration. Minor mode music rarely requires the tone *soh*. In fact a free use of *soh* by leap upsets the minor key and establishes the supremacy of *doh*. Instead of *soh* the under half-tone below *lah* is used and named from the tone it displaces (after the same manner as *fah* and its sharp fe) as soh sharp *se*. As both the effect and name are new *se* should be introduced as were the tones of the scale when they were first taught ; that is, the new mental effect should be dwelt upon and contrasted with other known effects.

(To be continued.)

Query Column.

Algebra.

1. QUADRATIC.—Solve :—

(1) $x^3 + 3ax^2 = 4a^3$.

(2) $\dfrac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}} - \dfrac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}} = 8\sqrt{x^2-1}$.

(1) $x^3 + 3ax^2 = 4a^3$

$x^3 - a^3 = 3a^3 - 3ax^2$

$= 3a(a^2 - x^2)$

$= -3a(x^2 - a^2)$

Dividing each side by $(x - a)$]

$x^2 + ax + a^2 = -3a(x + a)$

$= -3ax - 3a^2$

$x^2 + 4ax + 4a^2 = 0$

Extracting square root]

$x + 2a = 0$

$\therefore \underline{x = -2a.}$

As we divided by $(x - a)$, we can put $x - a = 0$,

$\therefore \underline{x = a.}$

$\therefore \underline{x = a, \text{ or } -2a.}$

(2) $\dfrac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}} - \dfrac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}} = 8\sqrt{x^2-1}$

$\dfrac{(x+\sqrt{x^2-1})^2 - (x-\sqrt{x^2-1})^2}{(x-\sqrt{x^2-1})(x+\sqrt{x^2-1})} = 8\sqrt{x^2-1}$

$\dfrac{x^2+2x\sqrt{x^2-1}+x^2-1-(x^2-2x\sqrt{x^2-1}+x^2-1)}{x^2-(x^2-1)} = 8\sqrt{x^2-1}$

$4x\sqrt{x^2-1} = 8\sqrt{x^2-1}$

$4x = 8$

$\therefore \underline{x = 2.}$

As we divided by $(x^2 - 1)$, we can put $x^2 - 1 = 0$,

$x^2 = 1$

$\therefore \underline{x = \pm 1.}$

$\therefore \underline{x = 2, \text{ or } \pm 1.}$

General.

1. DARTMOOR.—A lever 10 feet long balances about a point 4 feet from one end, but when loaded with 20 lbs. at one end and 4 lbs. at the other, it balances about a point 3 feet from the end.
Find its weight.

Taking moments—

$20 \text{ lbs.} \times 3 = \text{weight of lever} \times (4-3) + 4 \text{ lbs.} \times (10-3)$

$60 \text{ lbs.} = \text{weight of lever} + 28 \text{ lbs.}$

$\therefore$ weight of lever $= 60 \text{ lbs.} - 28 \text{ lbs.}$

$= 32 \text{ lbs.}$ Ans.

2. CARNEDDIAN.—The expression you give can be applied to the solutions of equations, but we have not come across an instance where it might be used.
The expression generally used is

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

This can be applied in the equations

(1) $\dfrac{\sqrt{a+x}-\sqrt{a-x}}{\sqrt{a+x}+\sqrt{a-x}} = b.$

(2) $\dfrac{x+\sqrt{12a^2-x}}{x-\sqrt{12a^2-x}} = \dfrac{a+1}{a-1}.$

(3) $\dfrac{\sqrt{a^3-x^3}-\sqrt{y^3+x^3}}{\sqrt{a^3-x^3}+\sqrt{y^3+x^3}} = \dfrac{c}{d}$

3. H. CHALLENGER.—Your question is very vague, as there are a number of keys to Algebras. You ask for a book entitled 'Solutions to Algebra.' Do you mean the solutions of the algebraical questions set at some examinations? If so, please state the examinations. There is a book called 'Tips in Algebra,' 4s. 6d.

4. BEATRICE.—Any school whatsoever can be called a High School. The name of course implies that the instruction given in it would qualify pupils to pass the Examinations of the Oxford and Cambridge Board or the London Matriculation.

—o—

Practical Perspective for Pupil Teachers.

E. G. BAKER, B.SC., B.A.,

Vice-Principal of the Training College, Carmarthen.

With fig. 82 for a guide, work the following exercises:—

EXERCISES.

Scale 1 in. to 1 ft. Height of spectator's eye above the ground plane, 3 ft.; distance of eye from picture plane, 6 ft.

1. Place in perspective the solid of which fig. 80 is the end elevation. The solid is resting on the ground plane on the face AB, with the corner A 1 ft. to the right and 1 ft. in the picture, and the side AB of the base making an angle of 60° with the ground line. The solid is 3 ft. long.

2. Regarding Fig. 79 as the end elevation of a solid resting on the face AB on the ground plane, place the same in perspective with the corner A 2 ft. to the right, and ½ ft. in the picture and AB making an angle of 40° with the ground line towards the right. The solid is 3ft. long.

3. In fig. 83 are given the plan and end elevation of a wire framework in the shape of a garden chair with arched end pieces.

Represent the same in perspective, supposing the leg A to rest on the ground plane at a point 1 ft. to the right and ½ ft. in the picture, the line AB joining the lower ends of the two nearer legs, making an angle of 40° with the ground line towards the right.

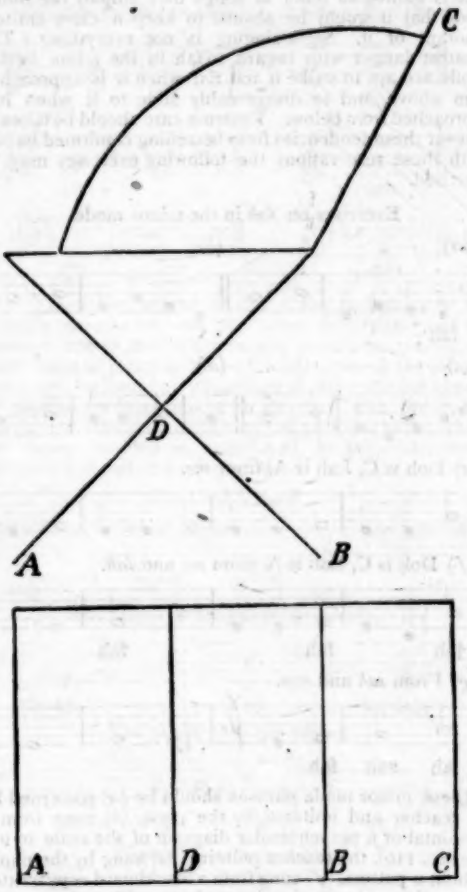


Fig. 83.

CIRCLES.

The curve most frequently requiring projection is the circle, and although the student who has fully grasped the method of projection of the curves already treated should be able to project any curve, it will be well to call attention to a special system of auxiliary lines which is most commonly employed to project a circle.

In fig. 84 are shown the projection of a single circle in a horizontal plane and the projection of a cylinder standing on a circular end. The circle to be projected being placed in position it is enclosed in a square with two sides parallel to the ground line. If, however, any vanishing points are required for the working of a problem, it may be advantageous to choose other directions for the sides of the square. This will be left to the discretion of the student. The square having been drawn around the circle we next draw its two diagonals.

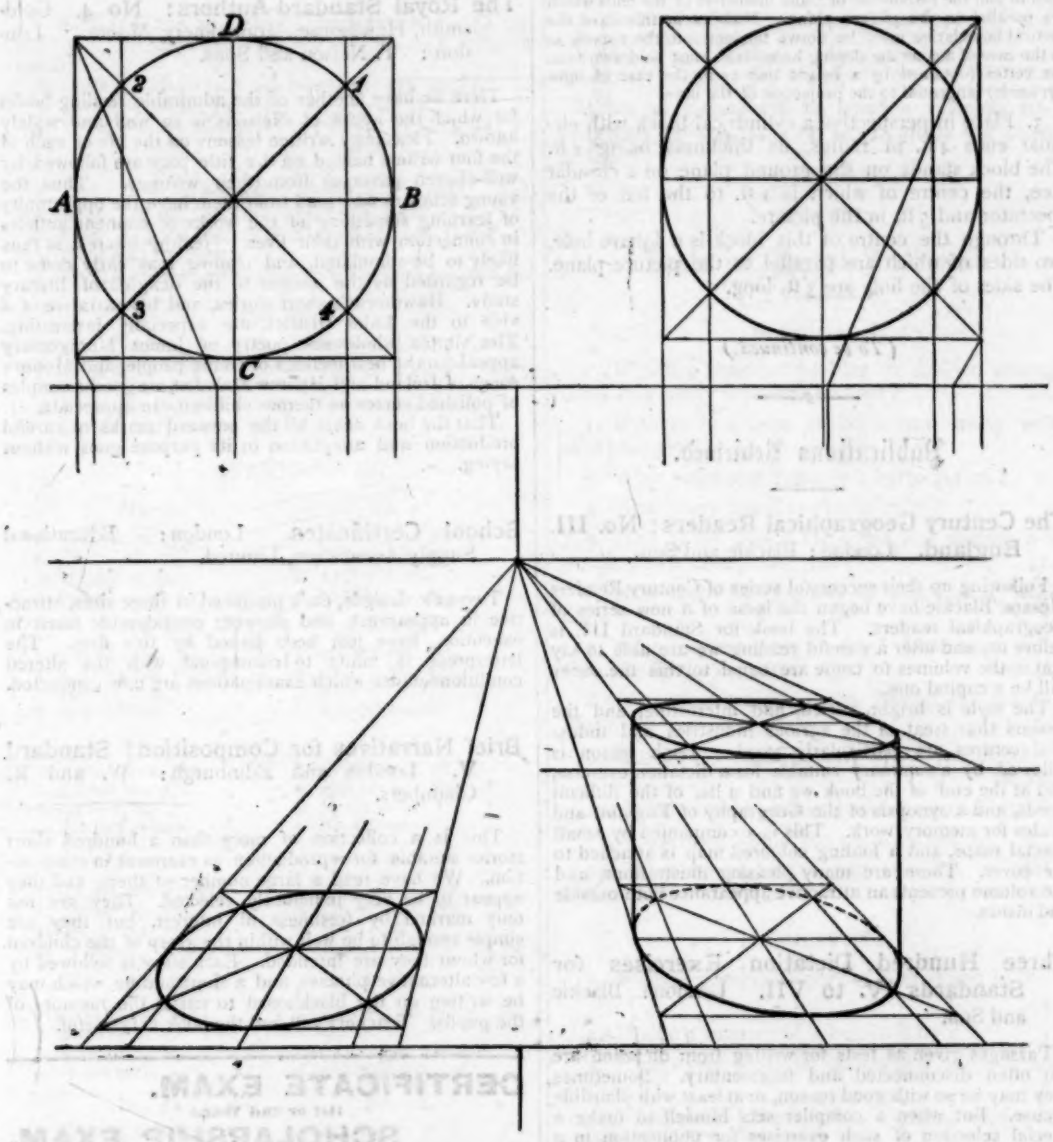


Fig. 84.

These cut the circle in the points 1, 2, 3, 4. Next draw two lines parallel to a side of the square which pass each through two of these points. In the figure we have drawn them perpendicular to the ground line, since they can be easily projected by means of the centre of vision.

Now project the square and the other lines which have been drawn. We thus obtain the projections of the points 1, 2, 3, 4, and of the centre of the square. Four other points on the circle can then be easily obtained by drawing the projections of the two diameters AB and CD. The projection of the circle must then be sketched passing through the eight points we have projected, which lie on its circumference.

EXERCISES.

Scale $\frac{1}{2}$ in. to 1 ft. Height of spectator's eye above the ground plane 6 ft.; distance of spectator from the picture plane 9 ft.

1. Place in perspective a circle 3 ft. in radius lying on the ground plane with its centre 2 ft. to the left, and 4 ft. in the picture.

2. Place in perspective a cone 7 ft. high standing on the ground plane on a base of 3 ft. radius, the nearest point of the base being 1 ft. to the left and 1 ft. in the picture.

NOTE.—The nearest point of the base is that corresponding with C in fig. 84. Observe the cylinder in fig. 84, and note that the vertical bounding lines are *tangential* to the projections of the circles. The mistake is often made of drawing these

lines to join the extremities of those diameters of the ends which are parallel to the picture plane. Now as in this case the vertical boundaries must be drawn tangential to the curves, so in the case of a cone the sloping boundaries must be drawn from the vertex (obtained by a height line as in the case of right pyramids) tangential to the projection of the base.

3. Place in perspective a cylindrical block with circular ends 4 ft. in radius, its thickness being 2 ft. The block stands on the ground plane on a circular face, the centre of which is 1 ft. to the left of the spectator and 5 ft. in the picture.

Through the centre of this block is a square hole, two sides of which are parallel to the picture plane. The sides of the hole are 3 ft. long.

(To be continued.)

—o—

Publications Reviewed.

The Century Geographical Readers: No. III. England. London: Blackie and Son.

Following up their successful series of Century Readers Messrs. Blackie have begun the issue of a new series of Geographical readers. The book for Standard III. is before us, and after a careful reading we are able to say that if the volumes to come are equal to this the series will be a capital one.

The style is bright, varied, and interesting, and the lessons that treat of the various industries and industrial centres are particularly good. Each lesson is followed by a summary suitable for a dictation exercise, and at the end of the book we find a list of the difficult words, and a synopsis of the Geography of England and Wales for memory work. This is accompanied by small special maps, and a folding coloured map is attached to the cover. There are many pleasing illustrations, and the volume presents an attractive appearance both outside and inside.

Three Hundred Dictation Exercises for Standards IV. to VII. London: Blackie and Son.

Passages given as tests for writing from dictation are too often disconnected and fragmentary. Sometimes they may be so with good reason, or at least with plausible excuse. But when a compiler sets himself to make a special selection of such exercises for publication in a book there can be no need for including scraps which practically have neither beginning nor end. Many of the passages in the book before us have that sort of completeness which seems to us desirable as a means of making the dictation exercise useful and interesting. Others—possibly those which have already been given at examinations—are of the fragmentary kind which, as a rule, should be avoided. The extracts are not supplied with means of identification, but many of them strike us as being taken from popular Standard reading books. At the end are some two dozen paragraphs from newspapers of recent date. This is a good feature, but it might have been better. We hold that in choosing pieces from a newspaper a teacher would do well to avoid party politics; but we notice in these few pages several passages in praise or defence of some action of the government, and one consisting of sneering comments on the opinions of a popular statesman.

Notwithstanding the blemishes we have noticed, the book is likely to be very useful to teachers in the way of saving time.

The Royal Standard-Authors: No 4. Goldsmith, Hawthorne, Montgomery, Moore. London: T. Nelson and Sons.

Here we have another of the admirable reading books for which the house of Nelsons is so well and widely known. Pleasantly written lessons on the life of each of the four writers named on the title page are followed by well-chosen passages from their writings. Thus the young scholars who read from them have the opportunity of learning something of the works of eminent authors in connection with their lives. Healthy interest is thus likely to be stimulated, and reading may early come to be regarded as the avenue to the delights of literary study. Hawthorne's short stories, and his narrative of a visit to the Lake District, are especially interesting. The simple wholesome poetry of James Montgomery appeals to the best feelings of young people, and Moore's songs of Ireland and Hebrew Melodies are good examples of polished verses on themes children can appreciate.

That the book bears all the outward marks of careful production and adaptation to its purpose goes without saying.

School Certificates. London: Educational Supply Association, Limited.

Two new designs, each produced in three sizes, attractive in appearance, and showing considerable merit in execution, have just been issued by this firm. The letterpress is made to correspond with the altered conditions under which examinations are now conducted.

Brief Narratives for Composition: Standard V. London and Edinburgh: W. and R. Chambers.

This is a collection of more than a hundred short stories suitable for reproduction as exercises in composition. We have read a large number of them, and they appear to be very judiciously selected. They are not only marked by freshness of interest, but they are simple enough to be well within the grasp of the children for whom they are intended. Each story is followed by a few alternative phrases, and a short outline which may be written on the blackboard to assist the memory of the pupils. Teachers will find the book very useful.

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2. From £29,010 13s. 1½d. take £357 17s. 10¾d.
3. Divide 6,201,509 by 96.
4. What number multiplied by 704 will give 33,792?

No. 19.

1. Add £6,294 18s. 3½d., £769 14s. 11¾d., £58 19s. 10½d., £8,394 13s. 5d., £6,298 17s. 7¾d.
2. From £19,010 10s. 0¼d. take £8,241 17s. 11½d.
3. Divide 86,472 by 47.
4. Multiply 7,698 by the difference between 107 and 63.

No. 20.

1. Add £29,876 17s. 4¼d., £8,095 13s. 10½d., £37,441 16s. 5¾d., £638 18s. 8½d., £29 12s. 7¼d., £7,325 0s. 10d.
2. From £7,008 13s. 5¼d. take £397 19s. 5¾d.
3. From 587 (6d. pieces) take 785 (3d. pieces).
4. Divide 5,675,604 by 76.

ANSWERS.

No. 1.

1. £16,002 5s. 2¾d.
2. £6,736 18s. 7¾d.
3. 121,388 + 62.
4. 85,511.

No. 2.

1. £217,489 3s. 2d.
2. £29,299 13s. 4½d.
3. £176 10s. 0d.
4. 94,786.

No. 3.

1. £20,024 15s. 7½d.
2. £13,904 14s. 10½d.
3. 142,715 + 4.
4. 1,097½ acres.

No. 4.

1. 179,823 19s. 0½d.
2. £35,375 15s. 9¾d.
3. 1,271 + 32.
4. 979,560 houses.

No. 5.

1. £103,048 0s. 7¾d.
2. £1,990 10s. 0¾d.
3. 5,576 + 67.
4. 350 half guineas.

No. 6.

1. £172,791 2s. 7d.
2. £28,111 15s. 2d.
3. 71,281 + 62.
4. No difference.

No. 7.

1. £1,511,018 0s. 11¼d.
2. £38,995 5s. 6½d.
3. 695 + 474.
4. 25 times.

No. 8.

1. £337,427 4s. 11d.
2. £15,006 14s. 3¾d.
3. 878 + 418.
4. 9,099,456.

No. 9.

1. £286,615 9s. 7¾d.
2. 48,886 19s. 8¼d.
3. 2,037.
4. 19,200 men.

No. 10.

1. £261,191 5s. 1¼d.
2. 847 + 113.
3. £1,133,691 15s. 2¼d.
4. £182,082 13s. 3¾d.

No. 11.

1. £80,891 5s. 9d.
2. £942 18s. 3¾d.
3. 7,469 + 61.
4. 547,500 loaves.

No. 12.

1. £14,923 3s. 10¾d.
2. £6,986 13s. 11¾d.
3. 1,148 + 50.
4. 5,675,604.

No. 13.

1. £53,359 4s. 3½d.
2. £13,048 12s. 2¾d.
3. 1,254 + 183.
4. 38,038.

No. 14.

1. £21,859 8s. 3d.
2. £13,989 17s. 9¾d.
3. 986 + 42.
4. 294,840 letters.

No. 15.

1. £18,738 3s. 7¼d.
2. £10,944 16s. 5¾d.
3. 4,827 + 77.
4. 212,122 men.

No. 16.

1. £207,379 2s. 7¾d.
2. £14,901 2s. 5¾d.
3. 68,616 + 67.
4. 782,397.

No. 17.

1. £64,865 2s. 8½d.
2. £22,089 15s. 5¾d.
3. 1,342 + 61.
4. 391,296 letters.

No. 18.

1. £175,607 1s. 8¾d.
2. 28,652 15s. 2¾d.
3. 64,599 + 5.
4. 48.

No. 19.

1. £21,817 4s. 2½d.
2. £10,768 12s. 0¾d.
3. 1839 + 39.
4. 338,712.

No. 20.

1. £83,407 19s. 10¼d.
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3. £4 17s. 3d.
4. 74,679.

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(To be continued.)

—o—

Tests in Mental Arithmetic.

Standard I.

1. If half a hundred marbles are divided among 5 boys, how many will each boy get? 10.
2. If there had been 10 boys, how many would each one get? 5.
3. What must you multiply 4 by to get 36? 9.
4. How many dozen are there in 36? 3.
5. How many pence are there in a shilling, a sixpence, and a threepenny piece? 21.
6. How many more pence do you want to make a florin? 3.
7. A boy saves a penny a day. How much will he save during the month of April? 2s. 6d.
8. How much would he save during the month of May? 2s. 7d.
9. How much would he save in both months? 5s. 1d.
10. What would 40 oranges cost at 2 a 1d.? 1s. 8d.
11. How many could you get for 11½d.? 23.
12. What would be the cost of 2 lbs. of beef at 11d. a lb.? 1s. 10d.

Standard II.

1. Multiply the eighth part of four dozen by 7. 42.
2. Divide a quarter of a hundred by 5. 5.
3. How many must be added to 6 dozen to make 4 score? 8.
4. What would 3 lbs. of cheese cost at 4d. for half-a-pound? 2s.
5. How much could you get for sixpence? ¾lb.
6. Find the cost of 6 lbs. of butter at 1s. 2d. a lb.? 7s.
7. What would ¾ lb. cost? 10½d.
8. How many pence are there in a crown, half-a-crown, and a florin? 114.
9. How many more pence are wanted to make half-a-sovereign? 6.
10. A horse and three sheep cost £40. The horse cost £28. What did each sheep cost? £4.
11. What would 2 gallons of milk cost at 2d. a pint? 2s. 8d.
12. How many quarts could you get for a florin? 6.

(To be continued.)

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3. The boundaries of the counties are shown by thin red lines.

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